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33448 7590 04/06/2007 ROBERT J. DEPKE LEWIS T. STEADMAN ROCKEY, DEPKE, LYONS AND KITZINGER, LLC SUITE 5450 SEARS TOWER CHICAGO, IL 60606-6306			EXAMINER WANG, EUGENIA	
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SHORTENED STATUTORY PERIOD OF RESPONSE			MAIL DATE	DELIVERY MODE
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

<b>Office Action Summary</b>	Application No. 10/553,241	Applicant(s) HOSOYA ET AL.	
	Examiner Eugenia Wang	Art Unit 1745	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

#### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☐ Responsive to communication(s) filed on \_\_\_\_\_.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-39 is/are pending in the application.
- 4a) Of the above claim(s) 3, 4, 20-39 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1, 2 and 5-19 is/are rejected.
- 7) ☒ Claim(s) 7, 8-19 is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 14 October 2005 is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |   |   |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)   | 4) <input checked="" type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. <u>3/29/07</u> . |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)  | 5) <input type="checkbox"/> Notice of Informal Patent Application   |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)<br>Paper No(s)/Mail Date <u>10/14/05, 1/8/07</u> . | 6) <input type="checkbox"/> Other: _____.   |

## **DETAILED ACTION**

### ***Election/Restrictions***

1. Applicant's election of Group 1 (claims 1, 2, and 5-19) in the reply filed on March 8, 2007 is acknowledged. Because applicant did not distinctly and specifically point out the supposed errors in the restriction requirement, the election has been treated as an election without traverse (MPEP § 818.03(a)).
2. It is noted that in the Election/Restriction requirement Applicant elected Group 1 (claims 1, 2, and 5-19) in the first paragraph and then withdrew the claims in the same paragraph. However, in a phone interview with Robert Depke on March 29, 2007, it was confirmed that claims 1, 2, and 5-19 were elected and that withdrawal of the same claims was a typographical error.

### ***Priority***

3. Receipt is acknowledged of papers submitted under 35 U.S.C. 119(a)-(d), which papers have been placed of record in the file.

### ***Information Disclosure Statement***

4. The information disclosure statements filed October 14, 2005 and January 8, 2007 have been placed in the application file and the information referred to therein has been considered as to the merits.

### ***Drawings***

5. The drawings are objected to because (a) page 4, paragraph 2, line 2 recites "[51a]" in fig. 16A, which Examiner believes is a typographical error meant to be '[151a]', (b) page 4, paragraph 2, line 2 recites "[53a]" in fig. 16A, which Examiner believes is a

typographical error meant to be '[153a]', and (c) page 59, paragraph 2, line 8 recites an electrolyte membrane [2] in fig. 9B, which Examiner believes is a typographical error meant to be '[102]'. Corrected drawing sheets in compliance with 37 CFR 1.121(d) are required in reply to the Office action to avoid abandonment of the application. Any amended replacement drawing sheet should include all of the figures appearing on the immediate prior version of the sheet, even if only one figure is being amended. The figure or figure number of an amended drawing should not be labeled as "amended." If a drawing figure is to be canceled, the appropriate figure must be removed from the replacement sheet, and where necessary, the remaining figures must be renumbered and appropriate changes made to the brief description of the several views of the drawings for consistency. Additional replacement sheets may be necessary to show the renumbering of the remaining figures. Each drawing sheet submitted after the filing date of an application must be labeled in the top margin as either "Replacement Sheet" or "New Sheet" pursuant to 37 CFR 1.121(d). If the changes are not accepted by the examiner, the applicant will be notified and informed of any required corrective action in the next Office action. The objection to the drawings will not be held in abeyance.

#### ***Specification***

6. The abstract of the disclosure is objected to because it is longer than 150 words and more than 1 page in length. Correction is required. See MPEP § 608.01(b).
7. The lengthy specification has not been checked to the extent necessary to determine the presence of all possible minor errors. Applicant's cooperation is

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requested in correcting any errors of which applicant may become aware in the specification.

### ***Claim Objections***

8. Claims 7 and 17-19 are objected to under 37 CFR 1.75(c) as being in improper form because a multiple dependent claim cannot depend from another multiple dependent claim. See MPEP § 608.01(n).

9. Claims 8-16 are objected to because of the following informalities: claiming a lower limit of 1.9330 for a g value (as recited in claim 8). This is seen as a typographical error, as the Specification lists the lower limit to be 1.9980 several of times (p 12, line 24; p 23, line 21; p 41, line 14; p 42, line 7; p 54, line 17; and p 55, line 4). If this is the case, the recitation of the lower limit 1.9330 for the g value, as listed in p 12, line 13 is seen as a typographical error as well. Since claims 9-16 are dependent on claim 8 and fail to rectify the issue, they are objected to as well. Appropriate correction is required.

### ***Claim Rejections - 35 USC § 112***

The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

10. Claims 8-16 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the enablement requirement. The claim(s) contains subject matter, which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the

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invention. While being enabled for the g value with a lower limit of 1.9980 (as recited in claim 8), it is not enabled for the value of 1.9930. See p 12, line 24, p 23, line 21, p 41, line 14, p 42, line 7, p 54, line 17, and p 55, line 4 for recitations for the g value lower limit of 1.9980. Since claims 9-16 are dependent on claim 8 and fail to rectify the issue, they are rejected as well.

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 1, 2, and 5-19 are rejected under 35 U.S.C. 112, second paragraph, as being incomplete for omitting essential elements, such omission amounting to a gap between the elements. See MPEP § 2172.01. The omitted elements are: what the carbon is in ratio with respect to, as applied to claims 1 and 8. Since claims 2, 5-7, and 9-19 are dependent upon either independent claim 1 or 8, they are rejected for the same reason.

### ***Claim Interpretation***

12. As to claims 1, 2 and 5-19, the following interpretation has been given to the recitation of "shake-up process" (as recited by claims 1, 2, and 7, which claims 5-7 and 9-19 are dependent upon).

The shake-up process is understood to be a test for the claimed product, as described by p 12-14 of the specification and therefore does not provide either structural limitations or procedural limitations, as applied to claim 1 (the product) and claim 8 (the process of producing the catalyst), respectively.

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

13. Claims 1, 2, 5, 6, 8-10, and 12 rejected under 35 U.S.C. 102(b) as being anticipated by "Porous Structure and Surface Chemistry of Nitrogen Containing Carbons from Polymers" (Lahaye et al.).

As to claim 1, Lahaye et al. teach the process of making nitrogen-containing synthetic active carbons (SCN-type carbons) from macroporous vinylpyridine resin (VPR) (p 585, col. 2, lines 1-3). Lahaye et al.'s product would inherently have a certain amount, and thus ratio, of carbon, and since the shake-up process is a measure of the final product, Lahaye et al.'s product would inherently be related to the control of a shake-up process.

As to claim 2, Lahaye et al.'s product would inherently have catalytic property to accelerate the oxygen reduction reaction ( $O_2 + 4H^+ + 4e^- \rightarrow 2H_2O$ ), as any activated nitrogen-containing carbon product would. As previously stated, Lahaye et al.'s product would inherently have a certain amount, and thus ratio, of carbon. Additionally, since the shake-up process is a measure of the final product, Lahaye et al.'s product would inherently be related to the surface control of a shake-up process.

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As to claim 5, an example of an activated final product (SCN-5) is shown to have a 1.54 wt % nitrogen (p 586, col. 2, para 6; table 1). This amount corresponds to a 1.14 mol% of nitrogen. See calculation below.

\*Use a 100 g basis of SCN-5 product.

$$93.74g\_C * \frac{mol\_C}{12.01g\_C} = 7.81mol\_C$$

$$1.07g\_H * \frac{mol\_H}{1.01g\_H} = 1.06mol\_H$$

$$1.54g\_N * \frac{mol\_N}{14.01g\_N} = 0.11mol\_N$$

$$1.07g\_O * \frac{mol\_O}{16.00g\_O} = 0.12mol\_O$$

$$0.52g\_S * \frac{mol\_S}{32.07g\_S} = 0.02mol\_S$$

$$total\_mol = 7.81 + 1.06 + 0.11 + 0.12 + 0.02 = 9.62mol$$

$$mol\%N = \frac{.11mol\_N}{9.62mol} * 100\% = 1.14mol\%N$$

As to claim 6, Lahaye et al. teaches a first nitrogen atom, N1s(1), having an electron bonding energy of value of 398.3 +/- 0.1 eV (p 589, col. 2, para 3, lines 10-13). Three other types of nitrogen were found as well: N1s(3), which has a binding energy of 400.5 +/- 0.2 eV (398.3 +/- 0.1 eV + 2.2 +/- 0.1 eV), N1s(4), which has a binding energy of 401.3 +/- 0.2 eV (398.3 +/- 0.1 eV + 3.0 +/- 0.1 eV), and N1s(5), which has a binding energy with 402.4 +/- 0.2 eV (398.3 +/- 0.1 eV + 4.1 +/- 0.1 eV) (p 589, col. 2, para 3, lines 13-18; p 590, col. 1, para 2; table 5). N1s(1) falls within the binding energy range of first nitrogen atom, and N1s(4) falls within the binding energy range of the second nitrogen atoms, as specified by claim 6.



As to claim 8, Lahaye et al. teach the process of making nitrogen-containing synthetic active carbons (SCN-type carbons) from macroporous vinylpyridine resin (VPR) (p 585, col. 2, lines 1-3). This copolymer is carbonized by being heated in air at 623 K and then later in argon to the temperature of 1223 K; furthermore the carbonized polymer is activated by steam at 1123 K (p 586, para 2). Lahaye et al.'s product would inherently have a certain amount of carbon, and since the shake-up process is a measure of the final product, Lahaye et al.'s product would inherently be related to the control of a shake-up process and/or having the spin density of the first unpaired electrons with a g value of that between the ranges of 1.9930 to 2.0000.

As to claim 9, Lahaye et al.'s activated nitrogen-containing carbon product is made using a precursor of vinylpyridine resin (an organic polymer powder) (fig. 1). The precursor is then subjected to the baking and steam activation process described with regards to the rejection of claim 8.

As to claim 10, Lahaye et al.'s process controls the baking, since the precursor is heated in air at 623 K and then later in argon while ramping the temperature to 223 K (p 586, para 2).

As to claim 12, Lahaye et al.'s process inherently controls (the shake-up process) by choosing which nitrogen-containing organic polymer compound material used.

### ***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

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invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

14. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lahaye et al..

The teachings of Lahaye et al. have been previously discussed and are herein incorporated.

As to claim 7, Lahaye et al. teaches a product with different nitrogen electron bond energies: N1s(1) at 398.3 +/- 0.1 (first nitrogen atom, as defined by claim 6),

N1s(4) at 401.3 $\pm$  0.2 eV (second nitrogen atom, as defined by claim 6), and N1s(5) at 402.4  $\pm$  0.2 eV (p 589, col. 2, para 3, lines 10-18; p 590, col. 1, para 2; table 5).

Lahaye et al. does not teach the third nitrogen atom (having a bonding energy of 403.5 $\pm$ 0.5 eV, as listed in claim 7) and does not specify the that the first nitrogen is present in an amount not less than 0.22 mol%, that the second nitrogen is present in an amount not less than 0.53 mol%, and the third nitrogen atom is present in an amount not less than 0.21 mol%.

Nitrogen placement within the carbon surface, which affects the bond energy, is a result of the reaction process and of the catalytic precursors. Absent criticality, it would have been obvious that the specified nitrogen types would be present as required by claim 7 as a result of the reaction carried out, depending on the catalytic precursors.

An alternate interpretation is that Lahaye et al.'s N1s(5) has a bonding energy substantially close to that of the third nitrogen atom in the instant application (the upper limit of Lahaye et al.'s N1s(5) is 402.6 eV, and the lower limit of the instant application is 403.0 eV) and would provide a similar if not the same functionality. It has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are prima facie obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (In re Woodruff, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)). Even with this

interpretation, the specified nitrogen types would occur in the carbon surface as a result of the reaction process and the catalytic precursors. Again, absent criticality, it would have been obvious that the specified nitrogen types would be present as required by claim 7 as a result of the reaction carried out.

15. Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lahaye et al..

The teachings of Lahaye et al. have been previously discussed and are herein incorporated.

As to claim 11, Lahaye et al. teaches that it has been known that nitrogen-containing carbon has been prepared by heat treatment of carbonaceous material with  $\text{NH}_3$  or  $\text{HCN}$  (p 585, col. 1, para 1, lines 7-9). Therefore Lahaye et al. teaches that nitrogen can be incorporated into carbon by the decomposition of a nitrogen containing material. The control of carbonaceous material to the  $\text{NH}_3$  or  $\text{HCN}$ , would inherently have a certain amount, and thus ratio, of carbon. Additionally, since the shake-up process is a measure of the final product, Lahaye et al.'s product would inherently be related to the surface control of a shake-up process.

Lahaye et al. does not specifically teach a method where the catalyst is made from both a carbonaceous material and a nitrogen-containing organic carbon polymer precursor (although he teaches using each separately). However, the motivation for replacing  $\text{NH}_3$  or  $\text{HCN}$  with a nitrogen-containing organic polymer is the fact that the nitrogen functional groups created with the decomposition of  $\text{NH}_3$  or  $\text{HCN}$  over carbonaceous material are thermally unstable under high-temperature reactions (p 585,

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col. 1, para 1, lines 7-13). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to replace  $\text{NH}_3$  or  $\text{HCN}$  with a nitrogen-containing organic polymer in order to produce nitrogen-containing fibers with higher thermal stability.

16. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Lahaye et al., as applied to claims 8 and 9, in further view of "Metal Containing Carbon Fiber from Coal Tar Pitch" (H.J. Hong et al.).

As to claim 13, Lahaye et al. teaches that it has been known that nitrogen-containing carbon has been prepared by heat treatment of carbonaceous material with  $\text{NH}_3$  or  $\text{HCN}$  (p 585, col. 1, para 1, lines 7-9). Therefore Lahaye et al. teaches that nitrogen can be incorporated into carbon by the decomposition of a nitrogen containing material. The control of carbonaceous material to the  $\text{NH}_3$  or  $\text{HCN}$ , would inherently have a certain amount, and thus ratio, of carbon. Additionally, since the shake-up process is a measure of the final product, Lahaye et al.'s product would inherently be related to the surface control of a shake-up process.

Lahaye et al. does not specifically teach (a) a method where the catalyst is made from both a carbonaceous material and a nitrogen-containing organic carbon polymer precursor (although he teaches using each separately) or (b) the method wherein coal-derived binder pitch is used as the carbonaceous material.

As to (a), the motivation for replacing  $\text{NH}_3$  or  $\text{HCN}$  with a nitrogen-containing organic polymer is the fact that the nitrogen functional groups created with the decomposition of  $\text{NH}_3$  or  $\text{HCN}$  over carbonaceous material are thermally unstable under

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high-temperature reactions (p 585, col. 1, para 1, lines 7-13). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to replace  $\text{NH}_3$  or  $\text{HCN}$  with a nitrogen-containing organic polymer in order to produce nitrogen-containing fibers with higher thermal stability.

As to (b), H.J. Hong et al. teach that coal tar pitch that was used as a catalytic precursor, which was later activated using steam delivered in Nitrogen at  $900^\circ\text{C}$  (p. 376, col. 1, para 3). Although in this procedure, the carbon catalyst was not further reacted with nitrogen, it still teaches that coal pitch is used as an activated catalytic precursor, as is required by the instant application. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use coal pitch as the type of carbon as a catalytic precursor for an activated carbon catalyst, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

17. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lahaye et al., as applied to claims 8 and 9, in further view of Morikawa et al..

As to claims 14 and 15, Lahaye et al. does not teach that the nitrogen-containing organic compound is *melamine* or hydrazine (as required by claim 14) or polyacrylonitrile, *melamine* resin, nylon, gelatin, or collagen (as required by claim 15).

Morikawa et al. teaches a different kind of catalyst, however, and likens vinylpyridine (the catalytic precursor used by Lahaye) and melamine (a catalytic precursor required by claims 14 and 15) (lines 22 and 43, respectively). Morikawa

teaches that the compounds all have an aromaticity-exhibiting portion and are thus derivatives of a similar molecule (col. 9, lines 15-25). Additionally, the derivatives also have compounds directly or indirectly substituted with electron attracting and/or electron donating groups (col. 9, lines 26-29). Therefore, melamine and vinylpyridine are chemically similar and would react in a similar manner when subjected to the same treatment. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to substitute melamine for vinylpyridine, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice.

*In re Leshin*, 125 USPQ 416.

18. Claim 16 is rejected under 35 U.S.C. 103(a) as being unpatentable over US 2002/0114126 (Hirahara et al.).

As to claim 16, Lahaye et al. teach that the steam activation is carried out at 1123 K in an argon stream (p 586, para 2). (Note: 1123 K = 850 °C, as the conversion from Kelvin to Celsius is -273)

Lahaye et al. does not teach (a) that the steam activation is carried out in a high-purity nitrogen stream or (b) that the steam activation is carried out at 1000 °C.

As to (a), Hirihara et al. teaches steam activation of carbon. Steam activation is done at the temperature of between 800°C and 1300°C, preferably between 850°C and 1200°C, and most preferably between 900°C and 1100°C (para 0027). It is mentioned that this is carried out in an inert gas, where nitrogen and argon are listed as examples (para 0027). Since the steam activation is to be carried out using an inert gas, argon

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(as listed by Lahaye) as well as nitrogen (as required by the instant application) would both be usable, as they would not chemically change the process. It would have been obvious to one having ordinary skill in the art at the time the invention was made to introduce the steam activation via a nitrogen gas, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 125 USPQ 416.

As to (b), Lahaye et al.'s process has the steam activation occurring at 850 °C, unlike the 1000 °C required by claim 16. However, it has been held that when the difference between a claimed invention and the prior art is the range or value of a particular variable, then a prima facie rejection is properly established when the difference in the range or value is minor. Titanium Metals Corp. of Am. v. Banner, 778 F.2d 775, 783, 227 USPQ 773, 779 (Fed. Cir. 1985). Generally, differences in ranges will not support the patentability of subject matter encompassed by the prior art unless there is evidence indicating such ranges is critical. In re Boesch, 617 F.2d 272, 205 USPQ 215 (CCPA 1980). In re Aller, 220 F.2d 454, 456, 105 USPQ 233, 235 (CCPA 1955). In re Hoeschele, 406 F.2d 1403, 160 USPQ 809 (CCPA 1969). Claims that differ from the prior art only by slightly different (non-overlapping) ranges are *prima facie* obvious without a showing that the claimed range achieves unexpected results relative to the prior art. (*In re Woodruff*, 16 USPQ2d 1935,1937 (Fed. Cir. 1990)). Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use steam activation at 1000 °C.



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19. Claims 17-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lahaye et al., as applied to claims 1, 2, 5-7, in further view of "Enhancement of the Catalytic Activity of Activated Carbons in Oxidation Reactions By Thermal Treatment with Ammonia or Hydrogen Cyanide and Observation of a Superoxide Species as a Possible Intermediate" (Stohr et al.).

As to claim 17, Lahaye et al. does not teach that the nitrogen-containing carbon is used in an electrochemical cell device.

Stohr et al. teaches that activated carbons have been used for oxidation reactions catalyzed by carbon as the active phase (p 707, col. 1, lines 2-7). These can be use in the cathode portion for O<sub>2</sub> reduction in electrochemical cells (p 707, col. 2, para 1, lines 2-4). Furthermore, Stohr et al. teach that the catalytic activity of activated carbon is enhanced after treatment of carbon with ammonia at elevated temperature, which causes nitrogen to bind to the surface of the carbon (p 707, col. 2, para 2, lines 3-15). The motivation for using the nitrogen-containing carbon in an electrochemical cell is that it serves as a better catalyst than carbon fibers, which were previously known to catalyze oxidation reactions. Therefore it would have been obvious to one having ordinary skill in the art at the time the claimed invention was made to use nitrogen-containing carbons in electrochemical cells in order to provide better oxidation catalysis.

As to claim 18, Stohr et al. teaches that electrochemical cells can be fuel cells (p 707, col. 2, para 1, lines 2-4). Again, as stated with respect to the rejection of claim 17, it would have been obvious to use nitrogen-containing carbon in the same manner, as they display higher catalytic activity.

As to claim 19, Stohr et al. teaches that carbon catalysts can be used as cathodes for the O<sub>2</sub> reduction reaction (p 707, col. 2, para 1, lines 2-4). Again, as stated with respect to the rejection of claim 17, it would have been obvious to use nitrogen-containing carbon in the same manner, as they display higher catalytic activity.

**Conclusion**

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eugenia Wang whose telephone number is 571-272-4942. The examiner can normally be reached on 8 - 4:30 Mon. - Fri., EST.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on 571-272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

  
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PRIMARY EXAMINER

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